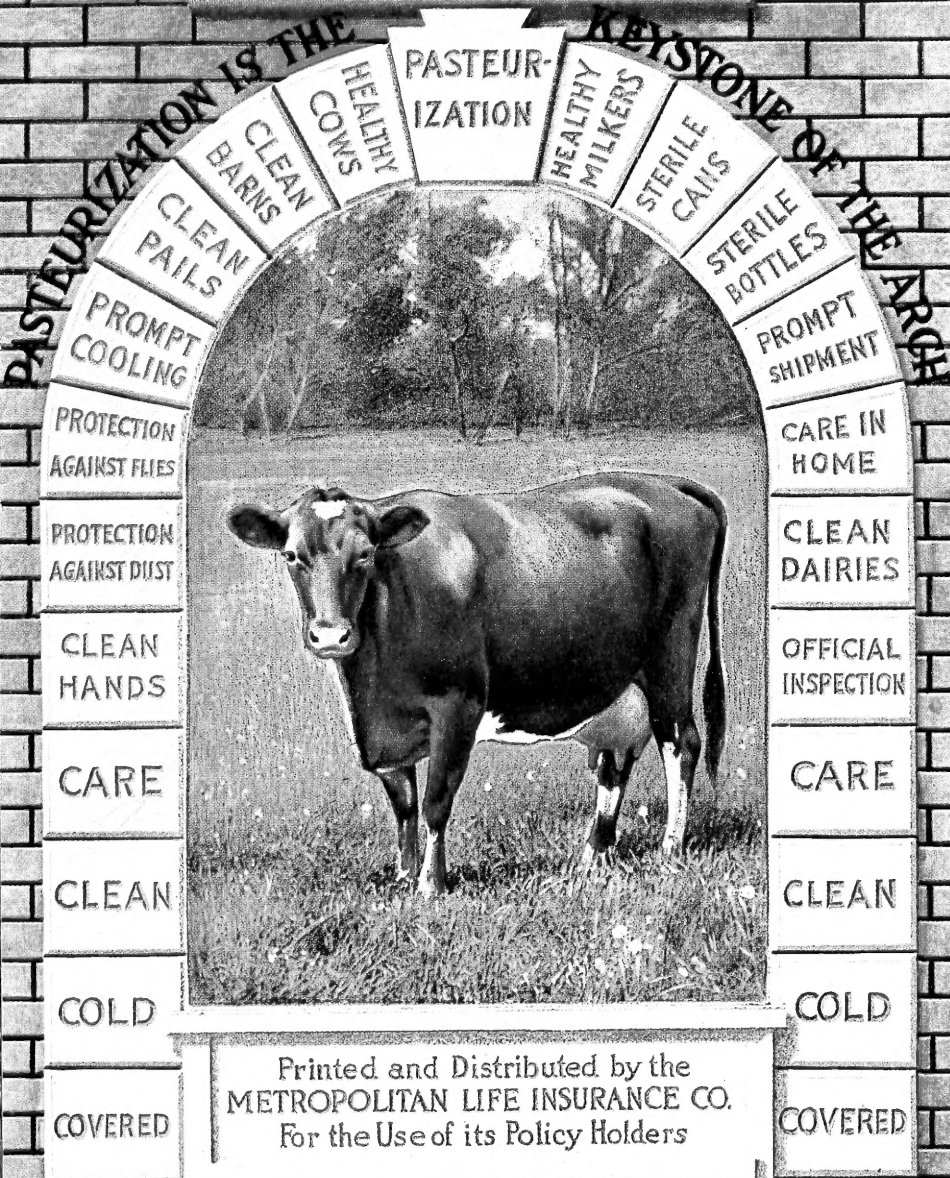


# MILK



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# All About Milk

BY

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# **The Long vs. The Short Haul**

70 percent of city babies get their food through a tube 60 miles long. It takes about 36 hours — often 42 hours — for the milk to run from the cow end of the tube to the baby end of the tube.

This tube is open in many places and baby's food is frequently polluted. It is often wrongly kept in overheated places.

Then there may be a diseased cow at the country end of the tube. And Yet Some People Wonder Why So Many Babies Die!

On the other hand the mother-fed baby gets its milk fresh, pure and healthful — no germs can get into it.

To Lessen Baby Deaths Let Us Have More Mother-Fed Babies.  
You can't improve on God's plan.  
For Your Baby's Sake — Nurse It!

*[Courtesy of the Chicago Health Department]*

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AUG 31 1914

# All About Milk.

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**Why Do We Have a Milk Question?**—Because milk is apt to be dangerous to health.

**Why is Milk Apt to be More Dangerous to Health Than Other Animal Food?**—Because it is mostly taken raw, while nearly all other animal food is cooked. Thorough cooking kills the harmful germs.

**Did Nature Intend Us to Use Cow's Milk?**—No. Milk was never intended by nature to be drawn into a pail, emptied into a can, carted to town, and placed in bottles which are left on the doorstep next morning. Further than this, cow's milk is often exposed to dust, flies and dirt, and frequently it is not used until it is two or three days old. Such stale, germ-laden milk may be quite injurious to the baby.

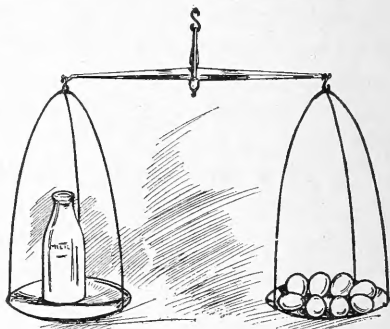


**What is the Advantage of Nature's Plan?**—In nature's plan the milk is taken directly at its source while pure, fresh, sweet, clean and wholesome. Milk was never intended to see the light of day. Nature's plan keeps out dirt, germs, flies and fevers. A breast-fed baby need not fear stale and partly decomposed milk, containing dirt and germs. The short haul is God's plan. The long haul is a poor substitute.

## MILK AS A FOOD.

**What is the Food Value of a Quart of Milk?**—One quart of milk is about equal in food value to any one of the following:

- 2 pounds of salt codfish.
- 3 pounds of fresh codfish.
- 2 pounds of chicken.
- 4 pounds of beets.
- 5 pounds of turnips.
- $\frac{1}{6}$  pound of butter.
- $\frac{1}{3}$  pound of wheat flour.
- $\frac{1}{3}$  pound of cheese.
- $\frac{3}{4}$  pound of lean round beef.
- 8 eggs.
- 2 pounds of potatoes.
- 6 pounds of spinach.
- 7 pounds of lettuce.
- 4 pounds of cabbage.



1 QUART OF MILK  
COSTING 8 OR 10 CTS.

8 EGGS COSTING  
25 TO 30 CTS.

## What is the Food Value of a Glass of Milk?

A glass of milk is about equal to

- 2 large eggs,
- a large serving of lean meat,
- 2 moderate-sized potatoes,
- 5 tablespoonfuls of cooked cereal,
- 3 tablespoonfuls of boiled rice, or
- 2 slices of bread.

**Is Milk a Cheap Food?**—Milk is one of the cheapest foods on the market. It is also one of the most easily digested. It is very nourishing, and may be served in a number of different ways, as custards, puddings, sauces, cream, ice cream, cheese, etc. Milk and milk products make up about one-sixth (16%) of all food eaten by the average American family.

**Is Milk Readily Tainted?**—Milk absorbs odors and flavors just as charcoal does. It will soon taste of tobacco, onions, fish or fruit if exposed to these things in an open pitcher or bottle. Turnips, onions and other strong-tasting substances fed to the cow will also give a flavor to the milk.

Milk should have no odor at all, or at most a slight charac-

teristic odor. A "cowy" odor means smelly barns, poor dairy methods and tainted milk.

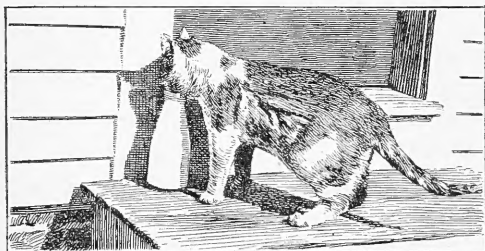
**Does Milk Decompose Readily?**—Milk decomposes more readily than any other food. It spoils even more quickly than fresh fruit and berries. It is the most difficult of all our food stuffs to collect, handle and transport in a safe and satisfactory manner. It requires the greatest care from pasture to pail, and from pail to palate.

**Is All Milk Dangerous?**—No. But there is no easy way of telling the good from the bad. Most of the dangers in milk may be avoided by pasteurization.

**Is Milk Apt to Contain More Impurities than Drinking Water?**—Water conveys only a few diseases—typhoid fever mainly; milk conveys many diseases—tuberculosis, scarlet fever, diphtheria, septic sore throat, typhoid fever and summer complaints of babies. Bacteria, as a rule, soon die in water, while they grow and multiply in milk.

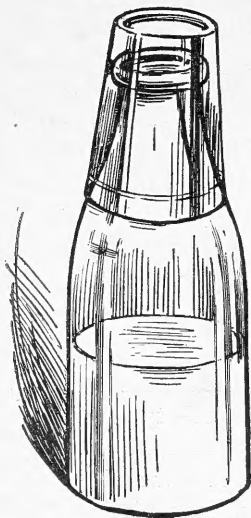
**Is Milk More Dangerous than Other Foods?**—Milk is responsible for more sickness and more deaths than all other foodstuffs put together.

**How Should Milk be Cared for in the Home?**—Milk should not be allowed to stand out of doors, but should be taken in as soon as it is delivered.



ONE OF THE THINGS THAT MAY HAPPEN TO MILK DURING THE EARLY HOURS OF THE MORNING.

The milk bottle should be protected in a box until taken into the house, and placed on ice as soon as possible.



In the home milk should be kept **cold, clean and covered**. If part of the milk in a bottle is used, do not replace the paper stopper, but invert a clean tumbler over the neck of the bottle and at once replace in the ice-chest. Never let the milk bottle stand around. Have a special place in the coldest part of the ice-chest for the milk bottles. The best way is to have the milk bottle touching the ice.\*

**What is the Advantage of the Individual Bottle?**—Cleanliness and protection from dirt, flies, fingers and germs. If it is well to sell crackers and cereals in individual packages, surely milk should be sold in the same way.

**What is "Dip Milk"?**—"Dip milk" is milk dipped from a can. It is also called "bulk milk." Milk is often sold in this way at grocery stores and small shops. The best qualities of milk are never sold in bulk, but always in individual bottles. Dip milk is therefore pretty sure to be the poorest grade.

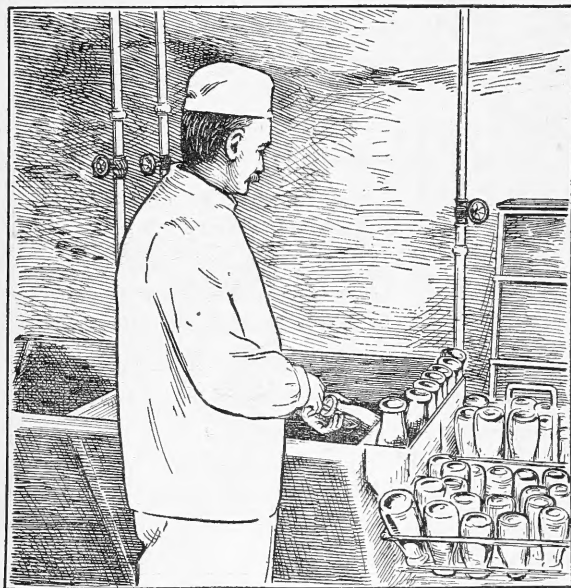
**What Special Care Should be Taken with the Milk Bottle?**—Milk should never be placed in a bottle that has not been disinfected by scalding with boiling water. Milk bottles should not be taken into



\*A cheap, home-made ice-box for milk can easily be made by following the directions given in a pamphlet issued by the Metropolitan Life Insurance Company entitled "The Child," page 13.



the sick-room. They should never be used for any other purpose than to hold milk. They should always be rinsed in cold water and then thoroughly washed and scalded before they are returned to the milkman. Never take milk from a dairyman who does not disinfect his milk bottles with boiling water or steam.



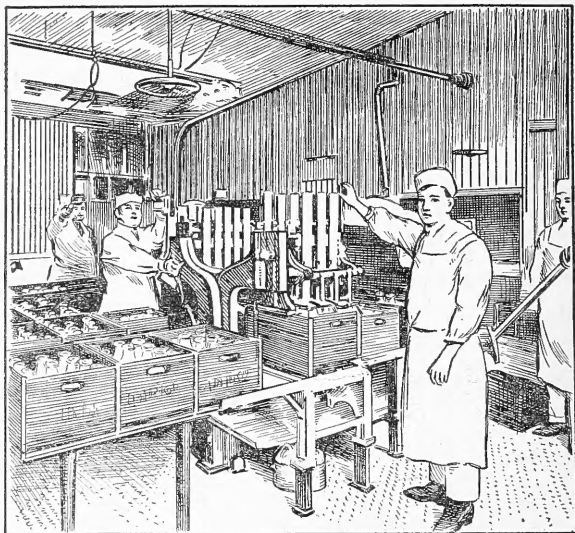
BOTTLES WASHED BY HAND. SUCH BOTTLES MUST SUBSEQUENTLY BE  
SCALDED OR STEAMED, FOR THE HANDS CANNOT STAND WATER  
HOT ENOUGH TO DISINFECT THE BOTTLES.

**How Much Milk is Used?**—Ten billion gallons a year in this country alone; this would make a lake large enough to float the navies of the world. Only about one-quarter of this vast amount is used as milk; the other three-quarters go into butter and cheese. Each person in the United States uses on an average about half a pint of milk a day.

**Should Milk Dealers be Licensed?**—It is more important to license persons engaged in the milk industry than it is to

license plumbers, undertakers or trained nurses. New York, Washington, Boston and other cities require all persons who handle milk to obtain an official license or permit from the health authorities.

Such a system helps the inspector to get cleaner dairies and to get rid of sickly cows, and makes it easier to enforce



MILK BOTTLES BEING FILLED AND CAPPED BY MACHINERY.  
THE BEST METHOD.

the milk regulations and to improve the supply. It is to the interest of every householder that the milk supply should be carefully supervised. Is your milkman licensed? Are his dairies inspected?

**How is Milk Made?**—Milk is formed directly from the blood and contains many of its important substances. Some of these pass unchanged from the blood into the milk. Others, however, are very much changed.

The breasts or udders are factories receiving blood as a raw product and delivering milk as the finished product.

**Of What Special Importance is the Fact That Milk is Formed Directly from the Blood?**—The blood contains special substances which guard us against infectious disease. Some of these substances pass from the blood into the milk and are of benefit to the nursing baby. For instance, mother's milk may contain the antitoxin of diphtheria which protects the baby. Nursing infants rarely have diphtheria. Cow's milk does not contain diphtheria antitoxin because cows are not subject to diphtheria. Mother's milk contains other protecting substances or guards for the baby that are not found in cow's milk; hence a bottle-fed baby is deprived of the natural protection which is found only in the mother's milk.

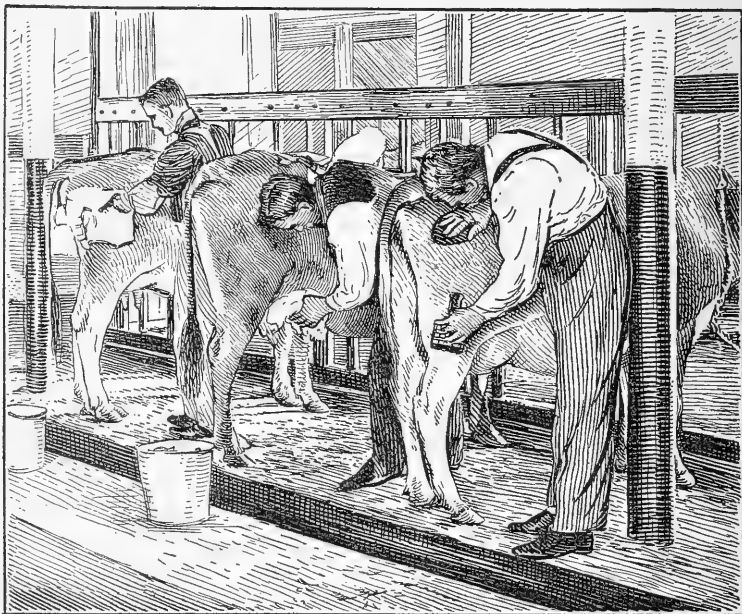
**Does the Milk of One Animal Differ Very Much from the Milk of Another?**—There is a general resemblance between the milk of all animals, but this resemblance is superficial only, for there are some very marked differences. The milk of whales



**DIRTY FLANKS. A COMMON CONDITION IN WINTER. FLANKS BECOME CAKED WITH MANURE, WHICH IS OFTEN NOT REMOVED. THIS IS THE SOURCE OF MUCH OF THE DIRT FOUND IN MILK.**

differs very much from the milk of goats, the milk of goats is quite different from that of dogs, and the milk of cows is different from that of women.

**Is the Milk of Any Other Animal Than the Cow Used as Food?**—While we are accustomed to cow's milk, the milk of other animals is preferred in some parts of the world. In Italy and other countries goat's milk is preferred. In certain parts of Europe asses' milk is much used; even the milk of mares, buffaloes and camels is made use of.



CLEANING COWS PREPARATORY TO MILKING. A SIMPLE OPERATION REQUIRING NO OTHER OUTLAY THAN A LITTLE TIME AND SOME CLEAN WATER. THE BUCKETS CONTAIN CLEAN WATER.

**Is There Any Advantage in Goat's Milk?**—Goat's milk is cheaper than cow's milk, although a fairly good goat will yield only about two quarts of milk daily. Still more important is the fact that goats rarely have tuberculosis; hence this danger

is at once eliminated. In our country there is an unreasonable prejudice against the humble goat, which is sometimes called the "poor man's cow."

**Could We Get Along Without Cow's Milk?**—There are some nations, as for example China and Japan, with millions of people, who get along pretty well without cow's milk or the milk of any other domestic animal. Chinese and Japanese babies are nursed by their mothers somewhat longer than in this country, and are weaned gradually upon cereals, grains and a mixed diet. With our habits and customs, it would be a serious matter to be deprived of cow's milk.

**Does Milk Contain Life?**—Milk is a vital fluid, but it is not alive. In fact, milk is dead and begins to spoil from the moment it is drawn; just as blood decomposes soon after it is shed. The only live things in milk are the bacteria, and they are very much alive.

**Why Did Our Parents Hear Nothing about the Dangerous Bacteria in Milk When They were Young?**—Because the dangers were not realized until recent years. Even after the tuberculosis germ was discovered in 1882, it took a long time before it was found that these bacilli (germs) often contaminate milk. The same story is true for typhoid bacilli, diphtheria bacilli, and other infectious germs.

We often hear people say, "Look at me! I am hale and hearty at eighty years. I have always been fond of milk, and it has never hurt me." Such people forget that the fruits of victory cannot be measured by the survivors alone—we must have the list of the killed and wounded too. More victims have fallen as a result of infected milk than as a result of bullets in war.

### COMPOSITION OF MILK.

**Is Milk a Simple Substance?**—No. It is very complex. It contains the chief parts of all the different foods commonly found on the table.

**What Foods Will Milk Take the Place of?**—Milk is equal to a meal consisting of meat and eggs, sugar and cereals, oils and fats,

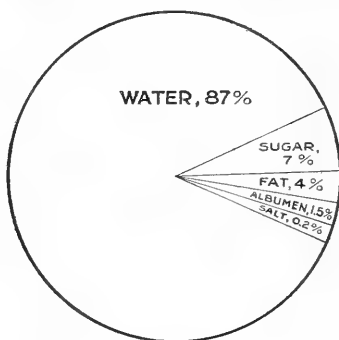
with salt and water. A milk diet therefore is like a mixed diet. Milk alone contains all the elements necessary to sustain life.

**What Does Milk Consist of?**—Milk consists of five chief substances:

1. Albumin. . . . like the white of egg.
2. Sugar. . . . . like cane sugar.
3. Fat. . . . . like butter.
4. Salt. . . . . like common table salt.
5. Water.

Milk also contains cells, ferments, gases, antitoxins and other important substances.

**Does Milk Contain Much Water?**—Milk is a very watery or dilute food. A pint of milk, weighing 16 ounces, is made up of about 14 ounces of water and 2 of solids. More precisely, about 87 per cent. of milk is water; the remaining 13 per cent. consists of solid substances, such as albumin, sugar, fat and salt.



MOTHER'S MILK.

**Does the Milk of All Cows Have the Same Amount of Water?**—No. Holstein cows usually yield a more watery milk than Jerseys or Guernseys; otherwise the milk of Holstein cows is quite as wholesome and nutritious as the others.

**Is Milk Often Watered?**—This mode of adulterating milk used to be practised, but is less common now, for it is very easy for the health officer to detect milk that has had water added to it.

## ALBUMIN.

**What is Albumin?**—Albumin is a substance like the white of egg or the lean of beef. There are many different kinds of albumin.

**What Kind of Albumin is Found in Milk?**—Chiefly casein. This is a very important part of milk because it readily separates out. When this happens the milk curdles.

**How Much Albumin Does Milk Contain?**—Cow's milk contains 4.5 per cent., mother's milk only 1.5 per cent. Furthermore, the albumins in cow's milk are mostly casein, while mother's milk contains very little casein.

Cow's milk contains much more albumin than mother's milk, because the calf is larger and grows much more rapidly than the infant; thus nature has provided a food especially fitted to suit the young of each animal; therefore, the milk of the cow may not be at all suitable to nourish the infant.

**Why is Cow's Milk Usually Diluted for the Baby?**—Because cow's milk contains about three times as much albumin as mother's milk. The two milks differ further, not only in amount of albumin, but in the kind of albumin they contain.

**Has This Any Importance in Infant Feeding?**—This is important because the albuminous matter forms curds, and some curds are more readily digested than others. Milk curdles as soon as it reaches the stomach.

**What is the Danger of Too Much Albuminous Matter?**—If cow's milk is not diluted the baby is placed in the position of a person living upon a rich meat diet. Too much meat leads to putrefaction in the intestines, just as too much albuminous matter in milk may be the source of indigestion and colic, which lead to summer complaint.

**What is the Scum that Forms on the Surface of Milk When It is Heated?**—This scum, or skin, is a little thickened albumin. The same thing takes place when an egg is boiled—the albumin thickens and hardens. The scum on milk is not harmful. It will not form if the vessel in which the milk is heated is well covered.

## SUGAR OF MILK.

**What is Sugar of Milk?**—A sweetish substance like cane sugar. Sugar of milk is found nowhere else in nature. It is called lactose.

**How Much Sugar Does Milk Contain?**—Cow's milk contains only about  $4\frac{1}{2}$  per cent., mother's milk 7 per cent.—almost twice as much. Hence sugar is usually added to cow's milk when the bottle is being prepared for the baby.

**What is the Special Use of the Milk Sugar in the Body?**—It is oxidized or burned in the body; hence it warms our bodies and keeps up the blood heat; it also furnishes "steam" to make the machine work. It serves as fuel to yield force and energy in the form of heat and muscular power.

**Will Too Much Sugar Harm the Baby?**—There is a temptation to add sugar generously to the milk for the bottle-fed baby, for the reason that sugar is fattening. It is a pleasure to see a chubby baby, but an over-fat baby is not a sign of robust health. Milk should not contain more than the 7 per cent. of sugar which is provided by nature. Too much sugar may set up fermentation in the intestines and lead to trouble.

**Just What Happens When the Milk Sugar Ferments?**—When milk sugar ferments it is changed into an acid. The acid thus formed causes the milk to turn sour and curdle.

**What Causes Milk Sugar to Ferment?**—Bacteria or germs.

**Can All Bacteria Ferment Milk Sugar?**—No, only certain kinds known as lactic acid bacteria, which have the power of converting milk sugar, or lactose, into lactic acid.

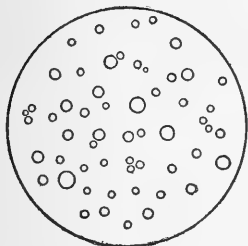
**Why Does Milk Turn Brown When Boiled a Long Time?**—Because some of the milk sugar is turned to caramel. This change is not harmful but unnecessary.

## FAT.

**How Does the Fat Exist in Milk?**—In the form of very fine droplets. These little fat droplets are lighter than the milk, hence rise and float on the surface, just as oil floats on water.



**How Much Fat Should Milk Contain?**—Mother's milk usually contains about 4 per cent.; cow's milk varies from 3 to 5 per cent. The law in almost all States requires cow's milk to contain not less than  $3\frac{1}{2}$  per cent. of milk fat, sometimes spoken of as butter fat.



FAT DROPLETS IN MILK.

**What is Butter?**—Butter consists of the fat drops which have run together when cream is churned.

**What is Cream?**—Cream is milk rich in fat—not pure fat. It contains all the elements of milk. Cream is simply “top milk,” as it is often

called. Cream varies greatly in richness. A heavy cream contains 40 per cent. or more of fat, a medium cream about 20 to 30 per cent., and a light cream from 13 to 16 per cent.

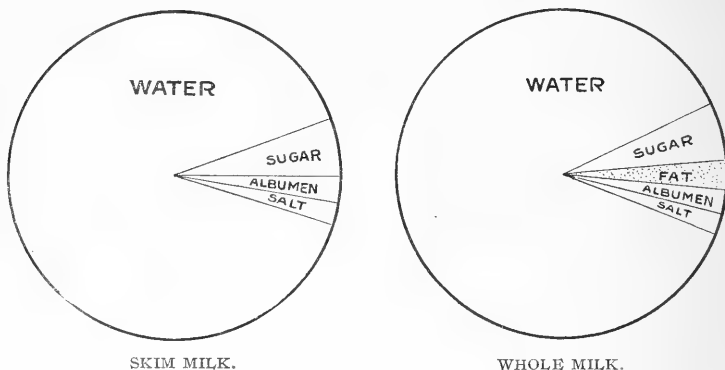
**Can the Richness of Milk be Judged by the Cream Line?**—Not always. The cream line is destroyed by heating or shaking. The cream rises rapidly in a watery milk. A narrow-necked bottle of thick glass gives the false impression of a long column of rich cream.

**Is There Any Sanitary Difference Between Cream and Milk?**—When the fat drops rise in milk they sweep the milk very much as a snowstorm sweeps the air. That is, the fat drops carry along with them many bacteria; therefore cream contains many more bacteria than the milk from which it is taken. As top milk or cream is often used to prepare modified milk for infant feeding, you will see how necessary it is to start with a milk of good quality.



FALSE IMPRESSION OF MUCH CREAM BECAUSE OF NARROW NECK.

**What is Skim Milk?**—When the fat or cream is removed from milk, what is left is called skim milk. The only difference between the two is the fat.



**Is Skim Milk Nutritious?**—Yes. It contains all the albumin, sugar, salts and other valuable parts of milk. It is simply milk without its fat. Skim milk is wholesome, nutritious and cheap. It is the cheapest form of albumin on the market. In order to be safe, skim milk must be obtained from pure milk.

**Is a Very Rich Milk Good for the Baby?**—No, it is harmful. Too much fat causes indigestion and a sort of self-poisoning, leading to diarrhea and summer complaint.

**What Kind of Salt Does Milk Contain?**—Milk contains the salts of lime, potash and soda, as well as phosphates, small quantities of magnesia, and traces of iron. These salts are of very great importance. They are, in fact, necessary to life.

**How Much Salt Does Milk Contain?**—Cow's milk contains 0.75 per cent.; mother's milk, 0.2 per cent. That is, cow's milk contains almost four times as much of these salts as mother's milk.

**What are Ferments?**—They are highly important substances found in all living things. They are exceedingly active and very important. Milk contains a number of ferments.

Pepsin is a ferment. When an apple is cut open and left standing it soon becomes discolored. This is due to a ferment in the apple which becomes active when exposed to the oxygen of the air. All fruits and vegetables contain ferments. All animal tissues also contain these active substances.

**Where Do the Ferments in Milk Come From?**—Some of them are in the milk as it leaves the udder. Some of them develop in the milk as a result of the growth and multiplication of bacteria. The bacteria secrete various kinds of ferments.

**Is It Possible to Modify Cow's Milk So As to Resemble Mother's Milk?**—Yes, to resemble it, but never to be "just as good." It is impossible to change cow's milk into mother's milk. By diluting cow's milk and adding sugar we can make a mixture that is something like mother's milk, but always lacking important substances.

**Can This Deficiency be Made Up?**—In part, by giving the baby barley-water and orange-juice.

**Is a Bottle-fed Baby Handicapped?**—Yes; seriously. The cow is a good foster-mother, but a foster-mother only. Mother's milk is fresh, clean and pure; cow's milk is apt to be stale, dirty and injurious.

## SOURING AND CURDLING OF MILK.

**What is the Curd?**—When milk curdles, very much the same thing takes place as when an egg is heated; the albuminous matter is rendered hard, lumpy and insoluble. The curd is the thickened casein which separates out of milk.

**Why Does Milk Turn Sour and Curdle?**—The bacteria growing in milk produce an acid which turns it sour, and the acid acts on the albuminous matter, causing it to thicken.

**Will Anything Else Curdle Milk?**—Yes, rennet. Rennet is the ferment found in the gastric juice; hence the first thing that happens to milk when it reaches the stomach is to become curdled. The curd is then acted on by the pepsin and digested. If the lumps are large and tough, the digestion is slower than if the lumps are soft and small.

**Is There Any Difference Between an Acid Curd and a Rennet Curd?**—No essential difference, except that the acid curd is sour on account of the acid, whereas the rennet curd is sweet. The curd itself is alike in both instances. The sweet curd is called clabber. Buttermilk usually contains acid curd.

**Is There Any Difference Between the Curd of Cow's Milk and Mother's Milk?**—A very marked difference. The curds from cow's milk are tough, large, lumpy and as hard to digest as a hard-boiled egg. The curds from mother's milk are soft, small, flaky, and as easy to digest as a soft-boiled egg.

**Is Curdled Milk Healthful or Injurious?**—Curdled milk obtained from pure milk is just as wholesome and nutritious for grown-up people as fresh milk. Curdled milk should not be used for babies except when advised by a physician.

### ABNORMAL MILK.

**Does Milk Sometimes Have an Abnormal Color?**—Milk may be red on account of the presence of blood. The blood may come either from an injury to the udder or from an inflammation. Cows feeding on colored plants, such as madder root, will secrete a colored milk. The red color which develops in milk upon standing is due to the growth of a red germ. Milk sometimes turns blue from the growth of a germ of that color.

**What is Slimy or Ropy Milk?**—Substances resembling mucilage sometimes develop in milk. This change is due to bacterial action. The milk may get so slimy that it can be drawn into threads ten feet long and as thin as a spider-web. In Norway such milk is considered a delicacy. It has no injurious properties, but it is objected to in this country.

**What is the Cause of a Bitter Taste in Milk?**—The milk may be bitter when freshly drawn, or may develop this taste on standing. In the first instance the bitter taste is usually due to the fact that the cows have fed on bitter herbs, such as wormwood, turnips, cabbages, etc. When the bitter taste develops in milk some hours after it has been drawn, it is due to a putrefactive change caused by the growth of bacteria.

When milk has a bitter taste with a soft, slimy curd, it shows that abnormal decomposition has taken place. Bitter milk should never be used; it may be dangerous.

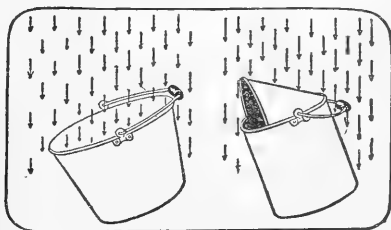
**Why is Bitter Milk Apt to be Dangerous?**—Because it may contain the so-called “ptomaines.” At least it contains bacteria that are said to produce ptomaines.

**Does Milk Ever Contain Drugs?**—A large number of drugs taken in through the mouth have been found in the milk of nursing mothers, such, for example, as mercury (calomel), antipyrine, opium, purgative salts, rhubarb, arsenic and potassium bromide. Every nursing mother knows how careful she must be with her diet in order not to affect the baby.

Cows are good botanists, but their judgment cannot be relied upon so far as the baby is concerned. Cows in pastures sometimes feed upon objectionable or poisonous weeds. Some of these poisons may pass into the milk. A cow that is kept to produce certified milk, which is the best grade of milk for babies, is not, under any circumstances, allowed to graze in the pasture on account of this danger. Such cows are given selected feed in suitable amounts.

### DIRTY MILK.

**Is Milk Often Dirty?**—Yes, very often. Frequently it contains so much dirt that the specks may be seen as a sediment in the bottom of the bottle or glass. Ordinarily the dirt cannot be seen because the dairyman has filtered the milk or taken out the dirt in a special machine called a clarifier. Filtration



TWO KINDS OF MILK PAILS. THE OPEN PAIL, ADMITS THE DIRT; THE COVERED PAIL KEEPS MUCH OF IT OUT.

will take out the specks, and clarifiers will make milk *look* cleaner, but these processes do not improve the milk except in appearance. The bacteria and poisons cannot be filtered out nor separated out. The Commissioner of Health of Chicago estimated that twenty-five tons of dirt are brought in through the city milk supply every year.

**Does Milk Hide the Dirt?**—Yes, because it is opaque. Try it for yourself. Add a teaspoonful of mud to a quart of milk. Mix it up. The milk will look as white and pure as before the mud was added. The opacity of milk covers a multitude of sins.

**What is the Dirt Test?**—Filter a pint or a quart of milk through some clean white cotton, or through several layers of white cloth, and notice the brownish or blackish stain.



FOUR GRADES OF MILK AS INDICATED BY THE DIRT TEST. ONE PINT OF MILK WAS POURED THROUGH EACH OF THESE DISCS OF ABSORBENT COTTON, WHICH WERE PERFECTLY WHITE AT FIRST. THEY SHOW FOUR GRADES OF MILK, AS FOLLOWS: 1, PERFECTLY CLEAN; 2, SLIGHTLY DIRTY; 3, DIRTY; 4, VERY DIRTY.

**What Does Most of the Dirt Consist of?**—Mostly of cow dung; also of particles of dust from the air, bits of straw, parts of insects and trash of all kinds.

**What are the Objections to Dirty Milk?**—Dirty milk spoils much more quickly than clean milk. Dirty milk is laden with bacteria, and may be harmful, especially to the tender infant.

### BACTERIA IN MILK.

**Does Milk Always Contain Bacteria?**—All cow's milk bought upon the market contains some bacteria. Usually it contains a vast number—millions in every teaspoonful. Often they are innumerable—like the stars in the heavens.

**Are These Enormous Numbers of Bacteria in Milk Harmful?**

—They are not necessarily harmful. Mere numbers need not frighten us. It is the kind of bacteria rather than the number that concerns us. Many of the bacteria in milk are our friends, not our enemies.

Great numbers of bacteria are undesirable and unnecessary. They mean that the milk is dirty, or stale, or has not been kept cold. The number of bacteria, then, is a general index of the sanitary quality of the milk.

**Where Do the Bacteria Come From?**—A few may be in the milk before it leaves the udder. For the most part they fall from the cow into the milking-pail during milking. They also fall into the milk with the dust from the air, or are washed in from dirty hands, or taken up from pails, bottles and anything else with which the milk comes in contact.

**Do Bacteria Grow in Milk?**—Yes. They grow and multiply in milk at a rapid rate. Milk is a perfect food for germs. In twenty-four hours one single germ may have billions of descendants. They love milk as much as the baby does.

**Is Milk Graded According to the Number of Bacteria?**

Milk is graded according to the number of germs it contains:

Certified milk . . . Less than 10,000 bacteria in each thimbleful.\*

Inspected milk . . . Less than 100,000 bacteria in each thimbleful.

Market milk . . . . Less than 1,000,000 bacteria in each thimbleful.

In Boston the limit for market milk is 500,000; in New York, 1,000,000.

**What Effect Have Bacteria on Milk?**—They cause it to decompose. Sometimes the milk ferments; sometimes it turns putrid. Fermentation and putrefaction are two different classes of decomposition, and both are due to bacteria, but to different kinds of bacteria.

**What is Nature's Danger Signal?**—The souring and curdling of milk is called nature's danger signal. This is not so. Nature has no danger signal for milk. Curdled milk is not harmful—

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\*About 16 drops, or one cubic centimeter.

in fact, it may be beneficial. The dangers in milk cannot be seen with the unaided eye.

**What Usually Happens to Milk When Allowed to Stand?**—Usually it turns sour and curdles. This is the normal way for milk to spoil. It is a special form of fermentation caused by lactic acid bacteria.

### **CLEAN MILK.**

**Is It Difficult to Keep Milk Clean?**—No. It requires only intelligence and care.

**How Long Will Clean Milk Keep?**—Clean milk, kept cold and properly protected, shows very little change in three or even five or ten days. With special precautions it is possible to keep milk so that it may be shipped across the ocean and back again and still be in good condition.

At the Paris Exposition in 1900, milk shipped all the way from New York, New Jersey and Illinois to France arrived there in good condition, and remained pure and sweet. The French farmers were dumbfounded, for they could not bring their milk more than one hundred miles nor have it in good condition for more than forty-eight hours. Major Alvord, in charge of the exhibit, found it no easy matter to convince the milk experts on the jury that the American milk was in its natural state, uncooked and undoctored. Nothing but **cold** and **cleanliness** were used to obtain such wonderful results.

**Is Clean Milk Also Safe?**—It is naturally much safer than dirty milk, especially when the health of those who handle the milk is carefully supervised.

**Is Clean Milk Hard to Produce for the Market?**—No, it requires only a little intelligence and reasonable care. With care, cleanliness and the use of ice, a satisfactory grade of milk may be sent to market by any farmer. Good dairy methods are more important than fancy barns and high-bred cattle.

**What are the Chief Points in the Production of Clean Milk?**—Clean and healthy cows. Healthy milkers. Milk pails sterilized by scalding. Sterilized cans and bottles. Clean hands.



**Why is So Much of the Milk Found on the Market Dirty and Unsatisfactory?**—Because milk does not get the care and attention it deserves on most farms, especially on small farms.

### CERTIFIED MILK.

**How is Milk Classified?**—There are only two classes of milk—good milk and bad milk. On the market, however, we find many different kinds of milk: (1) certified milk; (2) inspected milk; (3) market milk.

There is a growing tendency to classify all milk as raw milk or pasteurized milk.

**What is Certified Milk?**—Certified milk is the very best, the very freshest, the very cleanest, the very purest and the very safest raw milk that it is possible to produce. It is milk of uniform composition, and of high quality, obtained by cleanly methods from healthy cows under special sanitary precautions.

**Who Certifies the Milk?**—A medical milk commission.

**Why Does Certified Milk Cost So Much?**—Because it requires a veterinary surgeon to test the cows with tuberculin in order to find out whether they have tuberculosis, and to examine them from time to time; because it requires a bacteriologist and also a chemist to analyze the milk; because a physician must supervise the health of the milkers; because the cows must be curried, groomed, and kept as clean as race horses; because sterilizers must be provided for the bottles and pails; because skilled foremen must be in attendance to be sure the milkers wash their hands and wear clean clothes; because the milk must be bottled and iced at the dairy; because the construction, lighting and ventilation of the cow barns must be extra good and the water supply especially safe, and because the greatest care and attention must be constantly practised. Constant watchfulness is the price of safety. All this costs more money than the usual slipshod methods. Even with all these precautions certified milk will have about ten thousand bacteria in each thimbleful.

**What is Inspected Milk?**—Inspected milk is a good grade of milk obtained from healthy cows by cleanly methods. Inspected milk is not quite as good as certified milk. It should not contain more than one hundred thousand bacteria in each thimbleful.

**What is Market Milk?**—All milk that is neither certified nor inspected goes by the name of market milk. It is often of a poor quality and not suitable for infant feeding.

### MILK FOR BABIES.

**Is It Safe to Raise the Baby on Cow's Milk?**—No. Ten bottle-fed babies die to one breast-fed baby. The chances are, therefore, ten to one against the bottle-fed baby. Mothers should always nurse their babies if possible and keep it up until the baby is six or nine months old.

**What are the Advantages of Breast Feeding?**—Breast feeding is cheapest, simplest and safest. It needs no training and is less troublesome than tending to bottles. It is best for the baby and best for the mother.

**What are the Disadvantages of Bottle Feeding?**—Bottle feeding requires skilled training to carry out safely; it requires skill and practice to modify the milk to suit the baby; it requires much more time and trouble than breast feeding. At best it is only a poor substitute.

Modify and prepare cow's milk as we may, it cannot take the place of mother's milk.

**What Milk Should be Selected?**—If the baby must be raised by hand, or weaned, select the best milk obtainable. Baby's milk should be certified or of equally high grade. It is poor economy to give the baby cheap milk. Cheap milk is apt to be poor milk.

**What Special Care Should be Taken?**—Never warm the milk until feeding time. It is dangerous to keep milk warm or tepid for over half an hour; therefore never keep it warm in a thermos bottle. Cleanse and scald the bottle at once, and

again before filling. Meanwhile keep cold and covered. Do not use rubber tubing on the nursing bottle. Keep away flies.

**What Should the Mother Do in Case of Doubt?**—Consult a physician, or go to the nearest milk station, dispensary or infant depot. Do not raise the baby according to the advice of neighbors.

**Can Many Babies be Saved?**—Yes. There is much preventable sickness and many unnecessary deaths. Impure milk is not the sole cause of this. Many babies can be saved by breast feeding, or the use of fresh, pure milk; by care and cleanliness, and by following the advice of the doctor. Read the little pamphlet called "The Child," issued by the Metropolitan Life Insurance Company.

**Does Milk Sometimes Injure Adults Too?**—Often. Many cases of typhoid fever, sore throat and other infections in grown-up people have been traced to contaminated milk.

### MILK AND DISEASE.

**What Diseases May be Due to Impure Milk?**—Summer complaints of babies, tuberculosis, typhoid fever, diphtheria, scarlet fever, septic sore throat and some other unusual diseases, such as malta fever, foot-and-mouth disease, "milk sickness," etc.

**Do Milk Epidemics Often Occur?**—The following record of sickness due to milk during four years in the city of Boston answers this question:

|      |                              |                     |
|------|------------------------------|---------------------|
| 1907 | Diphtheria . . . . .         | 72 cases.           |
| 1907 | Scarlet fever . . . . .      | 717 cases.          |
| 1908 | Typhoid fever . . . . .      | 400 cases.          |
| 1910 | Scarlet fever . . . . .      | 842 cases.          |
| 1911 | Septic Sore Throat . . . . . | 2,064 cases.        |
|      |                              | <u>4,095 cases.</u> |

More than four thousand cases of preventable sickness in one city in less than four years! All such milk epidemics are caused by raw milk, and never occur with properly pasteurized milk. Other cities have also been sufferers. Sanitarians know that milk is a common vehicle for the spread of infection

from country to town and back again from town to dairy, also from place to place in the country and in the city.

**How Often Does Milk Contain Germs of Tuberculosis?**—About one sample out of every twelve of the milk found in a large city contains germs of tuberculosis.

**What is the Evidence?**—The evidence from four typical American cities shows that, out of a total of 551 samples of milk examined, tubercle bacilli (tuberculosis germs) were found in 46, making a percentage of 8.3. This may be taken as the average percentage for the entire country. As a matter of fact, the percentage would be higher if our methods for the detection of the tubercle bacillus were more delicate.

**Are the Tubercle Bacilli in Milk Dangerous?**—Yes, especially to children. About 25 per cent. of tuberculosis in children is of the bovine variety. That is, about one out of every four cases of tuberculosis in children is contracted from cow's milk.

**How Do Children Contract Bovine Tuberculosis?**—Almost entirely through raw milk. There is comparatively little danger in meat, because tuberculosis of the muscles (flesh) is rare, and, furthermore, meat is usually cooked before it is eaten.

**Is There Any Difference Between Bovine Tuberculosis and Human Tuberculosis?**—Bovine tuberculosis usually attacks the glands, and causes scrofula and enlargement of the lymphatics of the neck and other parts of the body. Bovine tuberculosis is usually milder than human tuberculosis, although when it attacks the coverings of the brain (meningitis), or the bones of the spine (Pott's disease), the covering of the intestines (peritonitis), or other vital parts, it proves serious and often fatal. Sometimes the tubercle bacilli spread rapidly, causing galloping consumption, which may result in death in a few weeks.

**Do Cattle Suffer Often from Tuberculosis?**—Very often. Cows that are kept in poorly ventilated, sunless and unhygienic barns are very apt to develop tuberculosis, and under these conditions the disease spreads until it soon infects the whole

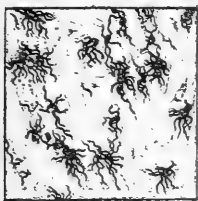
herd. Just so with men crowded together in dark, damp, poorly ventilated dwellings and workshops.

**How Can the Danger from Tuberculosis in Milk be Avoided?**—There are two methods of prevention. The first is to eliminate tuberculosis from cattle, and the second to pasteurize the milk.

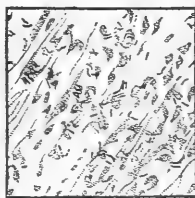
**Is It Easy to Eliminate Tuberculosis from Cattle?**—It is almost as difficult to eliminate tuberculosis from cattle as it is from man, and, furthermore, it is going to take a very long time to do so. Therefore, until that time arrives our only protection is through pasteurization, which kills the tubercle bacilli and renders them harmless.

**Can Raw Milk Ever be Trusted?**—If a herd of cows has been carefully tested with tuberculin, and these tests are repeated every six months, and if the herd, furthermore, is examined from time to time by a skilled veterinary surgeon, then the milk from such a herd may, with all reasonable safety, be regarded as free from danger of conveying tubercle bacilli.

**Do Tubercle Bacilli Grow in Milk?**—They do not grow and multiply in milk under ordinary circumstances. The tubercle bacilli found in any sample of milk are there, as a rule, because the cow has tuberculosis.



TYPHOID GERMS.



TUBERCULOSIS GERMS IN SPUTUM.

### TYPHOID FEVER.

**Does Milk Convey Typhoid Fever?**—Milk is rather frequently responsible for cases of typhoid fever, much more often than other raw food, such as oysters, celery and watercress.

**Do Typhoid Bacilli Grow in Milk?**—They grow very well. Milk may be teeming with myriads of typhoid bacilli in every drop and yet the milk has not been changed in appearance, color or taste. There is, therefore, no way of telling whether a glass of milk that seems sweet, good and wholesome does or does not contain this danger.

**How Do Typhoid Bacilli Get into the Milk?**—Cows do not have typhoid fever. The disease is peculiar to man; therefore typhoid bacilli always get into the milk from man and not from the cow, as is usually the case with tubercle bacilli.

**Is it Necessary for the Milker to be Ill with Typhoid Fever in Order to Infect the Milk?**—Not at all. The milker may be a bacillus carrier—that is, in perfectly good health and nevertheless discharging typhoid bacilli.

**Where do the Typhoid Bacilli Usually Get into the Milk?**—Usually on the farm, sometimes at the city dairy, occasionally on the railroad in transportation, sometimes at a corner grocery store, and sometimes in the home.

**Is the Danger from Typhoid Carriers Serious?**—Bolduan estimates the startling total of 90 to 120 typhoid carriers which probably menace the milk supply of New York City. He also estimates that from 300 to 400 cases of typhoid fever each year come in contact with the milk supplied to New York City. This estimate is based upon the fact that about 200,000 persons come in more or less intimate contact with the milk from over 40,000 dairy farms, producing 1,600,000 quarts of milk used in New York City every day. Approximately the same proportions hold for smaller cities and towns.

### SCARLET FEVER.

**Can Milk Convey Scarlet Fever?**—It does. An epidemic due to infected milk occurred in the spring of 1910 in and around Boston, with a total of 482 cases. As soon as this milk was pasteurized the epidemic was checked, and three days following came to an end.

**Does Scarlet Fever Come from the Cow or from Man?**—There is a suspicion that some of the diseases of the cow, caused by a little germ known as the streptococcus, may cause a disease resembling scarlet fever in man. As a rule, however, the milk becomes contaminated from human sources.

**Is It Easy to Keep Scarlet Fever Out of Milk?**—It is very difficult, because the disease is sometimes so mild that it is hard to recognize the cases. These are known as "missed cases," but these mild or missed cases are just as contagious as the severe and fatal cases. Sometimes the scarlet fever virus continues to be discharged from the throat or from a running ear a long time after convalescence.

### DIPHTHERIA AND SORE THROAT.

**What are the Facts Concerning Diphtheria?**—Diphtheria bacilli also grow well in milk without changing its taste, odor or color. Bacillus carrying is common in diphtheria. Numerous outbreaks of diphtheria have been traced to infected milk.

**May Septic Sore Throat be Caused by Milk?**—A disease variously known as septic sore throat or tonsilitis, or quinsy, is sometimes conveyed by milk. Septic sore throat, due to infected milk, is well known in Great Britain, but the first outbreak to be recognized in this country occurred in May, 1911, in Boston. Since then outbreaks have been reported from Chicago, Baltimore, Concord (N. H.) and many other places. The disease is evidently spreading.

**Is This Form of Sore Throat Serious?**—It is serious on account of the complications, which sometimes result fatally. It is a disease that is especially liable to affect adults.

**Are Fresh Milk Products Also Apt to be Dangerous?**—Yes. Cream, ice cream, cottage cheese and other fresh-milk products may convey infective agents if present in the milk from which they are made.

## PASTEURIZATION.

**What is Pasteurization?**—Pasteurized milk simply means heated milk. In the language of the kitchen, it means par-boiling or “scalding.” It is not necessary to boil milk in order to pasteurize it; if you have no thermometer it is advisable to bring it to a boil in order to be sure that the harmful germs are killed.

After the milk is heated it must be suddenly chilled and kept cold. This is an essential part of the process of pasteurization.

The word pasteurization is used in honor of the great scientist, Pasteur, who discovered the process.

**What is the Proper Temperature and Time for Pasteurization?**—The milk should be heated to 148 degrees Fahrenheit for 30 minutes. A lower temperature or shorter time may not kill the bacteria. A higher temperature or longer time is not necessary.

**What is the Object of Pasteurizing Milk?**—There is only one object, and that is to destroy the harmful bacteria.

**Does Pasteurization Destroy All Bacteria in Milk?**—No, only harmful and frail varieties of bacteria. The harmless and hardy forms survive, and will continue to grow and multiply. Therefore, pasteurized milk turns sour and curdles in the same way that unheated milk spoils.

**Why is Rapid Cooling Important?**—The milk should be chilled at once after heating and kept cold, because if allowed to cool slowly it remains at blood heat for several hours. This is the best temperature for the growth and multiplication of bacteria and their poisonous products.

**Does Pasteurization Improve the Milk?**—Pasteurization neither improves nor harms the milk itself. Poor milk is not any better because it has been pasteurized. It would avoid confusion if pasteurized milk were simply called heated milk, for that is all it is.

**Is Pure Milk Better Than Purified Milk?**—It is; but it is so difficult to get pure milk that our only real safety lies in



pasteurization. So long as raw milk is apt to be dangerous milk, our only protection lies in heating the milk, thereby killing the germs of tuberculosis, typhoid fever, diphtheria, scarlet fever, septic sore throat, etc.

**How Does the Sanitarian Regard Pasteurization?**—As a public health safeguard. It corresponds to the filtration or purification of water. Sanitarians unanimously favor pasteurization.

**How Can the Efficiency of Pasteurization be Safeguarded?**—Only by official control. Pasteurization is too important a public health measure to leave to the caprice of each individual dairyman. The process should be guarded by health laws and regulations.

**Does Pasteurized Milk Require Greater Care Than Unheated Milk?**—Pasteurized milk must be handled at least as carefully as raw milk. It may become infected after pasteurization. Bacteria grow even more rapidly in heated milk than in fresh, raw milk. All milk, whether raw or heated, should be kept covered, cold and clean.

**What is the Best Method of Pasteurizing Milk?**—For family use it is advisable to obtain milk already pasteurized by a trustworthy dairy. It is cheaper, safer and better to heat the milk by wholesale in a large plant with competent supervision than to depend upon each household heating its daily supply. If water needs purification it is filtered at a central station and not left for each individual kitchen.

**How Can Milk be Pasteurized in the Home?**—The best and simplest method of pasteurizing milk for infant feeding is in the Straus pasteurizer. Milk of a good quality is placed in individual nursing bottles and heated according to directions given below.

**What is the Best Method of Pasteurizing Milk for Family Use?**—The easiest way to pasteurize milk for family use is to heat it in a double boiler, such as a rice-boiler, for three-quarters of an hour, and then to chill it quickly.

The Straus pasteurizer consists of a pail for water and a receptacle for the bottles of milk. It is used as follows:

After the bottles have been thoroughly cleaned they are placed in the tray (A) and filled with the milk or mixture used for one feeding. Then put on the corks or patented stoppers without fastening them tightly.

The pot (B) is now placed on the wooden surface of the table or floor and filled to the supports (C) with boiling water.

Place the tray (A) with filled bottles into the pot (B) so that the bottom of the tray rests on the supports (C), and put cover (D) on quickly.

After the bottles have been warmed up by the steam for five minutes, remove the cover quickly, turn the tray so that it drops into the water, replace the cover immediately. This manipulation is to be made as rapidly as possible

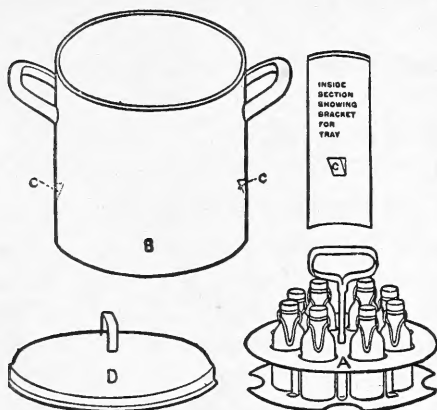


FIG. 72.—STRAUS HOME PASTEURIZER.

to avoid loss of heat. Thus it remains for twenty-five minutes.

Now take the tray out of the water and fasten the corks or stoppers air-tight. Cool the bottles with cold water and ice as quickly as possible, and keep them at this low temperature until cold.

Use the milk from the bottles and do not pour it into another vessel.

The milk should not be used for children later than twenty-four hours after pasteurization.

Emphasis is laid on the fact that only fresh, clean milk, which has been kept cold, should be used.

**What is the Great Advantage of Pasteurization?**—Pasteurization saves lives and prevents sickness.

**Is Pasteurization an Ideal?**—It is usually regarded only as a temporary expedient, that is, as the simplest, cheapest and least objectionable method of making raw milk safe.

**Should Babies be Given Pasteurized Milk?**—Babies should have mother's milk; there is no adequate substitute. If mother's milk is not available, babies are entitled to the best

and freshest cow's milk that can be obtained. **Whether such milk is to be modified, pasteurized or otherwise treated is a question for the doctor to decide in each individual case.** Unless very sure of the supply, the doctor will usually not take chances, and advise pasteurized milk for baby, especially during the summer time.

**Is Pasteurized Milk Less Nutritious?**—Pasteurized milk is just as digestible and just as nutritious as raw milk.

**Is It Necessary to Pasteurize All Milk?**—All milk that cannot be certified as clean, fresh and SAFE should be pasteurized.

### **THE SOLUTION OF THE MILK PROBLEM.**

**What is the Solution of the Milk Problem?**—Inspection and pasteurization. We need inspection to keep milk clean; we need pasteurization to render milk safe. Inspection goes to the root of the problem and helps bring us cleaner, better, fresher and safer milk. Inspection, however, has limitations. These limitations may be guarded against by pasteurization; hence a milk supply that is both supervised and pasteurized is the only satisfactory solution of the problem.



By LORADO TAFT

Courtesy Infant Welfare Society of Chicago.



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